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The Madras Agricultural Journal

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Editorial

Professor George B. Cressey of the Syracuse University, New York, in a recent discussion in London on world population very vividly brought home to his audience the reality of the rapid rise in world population by his comment that by the time his lecture and discussions were over in two hours the world population would have risen by six thousand. So every hour the world has an extra three thousand mouths to feed. India, therefore with approximately a seventh of the world population has proportiontely about 400 extra mouths added on every one hour of the day or night. But unfortunately our resources and expansion in food output do not keep pace with the growing population. Consequently the pressure upon the land has increased enormously to three to four thousand persons per square mile in some arable areas and the country thereby suffers from over population. There are 558,089 villages in India with a net population of 357 million, which is nearly four times that of England. And eighty percent of this population are directly dependent on Agriculture. This is more than double the population of people directly dependent on Agriculture in Western European countries. Hence India's problem of balancing resources with population is a vital one which has to be tackled sooner or later in the independent and resurgent India.

The Government of India has since Independence, set out to establish a Welfare State. When it drew up its first five year plan, production of food was given the highest priority as there could be no Welfare State without food. The Community Development Projects since initiated in October 1952 had "food receiving the primary emphasis in the initial stages of the programme." In 1953 the National Extension Service was launched with its main objective confined to the improvement of Agriculture. Thus, with the agricultural development as the chief preoccupation of the authorities in Government, India has made a start in solving the problem of feeding the growing millions. Consequent to these steps our per

capita consumption in food has since risen from the level of 1398 Calories in 1950—'51 to 1623 Calories in 1953—'54. Still we are far from the 2,500 Calories which is the recommended allowance for a 150 pound man.

Various steps are being taken by Government and non-Government bodies to mitigate the growing population and limited resources. The development of new industries and the expansion of existing ones to take redundant people off the land is the major objective of the second Five Year Plan. The first five year plan has succeeded largely in expanding the area under cultivation by reclaiming new areas, by development of irrigation facilities and bringing about an intensification in agricultural production; thus raising the output per acre. Many projects are either in the course of execution or are nearing completion.

Side by side to these technological improvements social readjustments are under way through land reforms. The objective appears to be to fix ceilings on holdings and the redistribution of the surplus land to the landless. The extent to which this policy will influence production is yet to be seen. Such a remedy to quote Sir John Russel "has not increased food output in parts of the world where such large ownerships have been abolished."

These remedies together with the far reaching policies envisaged by our Premier Pandit Jawaharlal Nehru after his recent visit to China will highlight the Second Five year plan of the country which is now in the making. The new ideas from China which have been successfully implemented and fruitfully worked out in an over populated country like China should yield tangible results in a country like ours, which has many social and economic problems in common with China.

Recent Advances in Plant Nutrition*

by

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Introduction: The naive view has often been expressed that the chemist has only to determine the plant food by analysis of the soil and then by subtraction from the total need of the plant one can say how much more is needed for a given crop and at this the problem of plant nutrition is solved. This is highly erroneous as only an almost trivial fraction of the total amount of any plant food in the soil is available to crops at any one time and there are innumerable complicating factors preventing the simple solution to the problem of estimating the amount actually available to the plant. Years of research has shown that the nutrition of the plant is a very complicated subject. From the time Jon Baptista Von Helmont (3) conducted his classical experiments with the feeding of the willow tree some 300 years ago to the modern times, much field has been covered in this fascinating study of plant nutrition.

Plant growth has been shown to be not merely a question of supplying the necessary mineral nutrients; but has time and again been proved in recent times to be determined by the complex environment of the plant in which the mineral supply from the soil is only one factor. There are many changes and interactions taking place in the soil which finally determine whether or not the individual nutrients will be available to the crops in suitable quantities and in the correct proportion. The recent advances made in this field could be generally classed under the following heads of study:

(1) The power of the soil to fix nutrients.

(2) Effect of other factors like organic matter, lime status etc., of the soil in plant nutrition.

Much headway has been made in recent times in improving plant growth through a study of the above factors and it shall be the object of this paper to briefly outline the advances made under each, with a brief review of the related fields.

Nutrient Fixing Capacity of Soil: By virtue of the exchange cations and anions in the colloidal fractions of a soil, a proportion of the added nutrients may be fixed in the soil. This reaction is

* Paper read at the College Day and Conference, 1954.

both an advantage and a disadvantage. It is advantageous in as much as the fixation process prevents the rapid leaching out of the nutrients from soil. It is disadvantageous in many instances as in the case of phosphorus and potash when a considerable portion of these added nutrients in the soil is never recovered by the crop due to the fixation. Acid soils and those containing free hydrated oxides of iron and aluminium present special problems in phosphatic fertilization. In such soils, these free oxides fix the phosphates by a process of absorption to such an extent that it is unavailable to the plant. The laterite soils of Malabar and the lateritic soil of Nilgiris in this State are good examples of such soils. These soils have a strong acid reaction, the pH being 5·5. On these soils, owing to their property of phosphate fixation, high dosages of phosphates are needed for a good crop. Thus in the Nanjanad manure mixture used for the potato crop, the dose of phosphate is about ten times that required in neutral soils for any good crop. About 1,000 pounds of phosphatic fertilizer in the form of super or super plus bone meal to give about 200 pounds of P_2O_5 per acre are used. Attempts were made in this State and in other countries to tackle this problem of phosphate fixation. The application of lime and organic matter in addition to super, placement of phosphate at the root zone, etc., were the outcome of such investigations. These however did not help to reduce the dosage of phosphate to be applied. Experiments at Rothamstead showed that silicates can replace the absorbed phosphate. New phosphatic materials were produced with a silicate combination and work was started in the laboratories at Coimbatore to test this silico phosphate on laterite soils. Silico-phosphate was prepared and pot tests conducted to evaluate its usefulness on the lateritic soils of Nanjanad in Nilgiris. The results of these tests showed that the availability of phosphate in the soil could be doubled by the use of the silicophosphate whereas super-phosphate failed completely in this respect (5). To confirm the findings of these tests and to evaluate their worth in terms of monetary value, large scale experiments have been planned under field conditions at Nanjanad. Better yields of potato with smaller dosage of silicophosphate than when super is applied is expected and thus it will be possible to attain a reduction in the manure bill of the potato grower. Apart from this, the production of the silico-phosphate fertilizer will bring into use the 8 million tons of Trichy phosphate deposit which has hitherto been abandoned as useless for conversion to superphosphate and which has now been found possible to convert into silicophosphate (6).

Effect of other factors like organic matter, lime status etc.: Struthers and Sieling (9) discussing the new ideas on the fixation of phosphates in soil have indicated that certain organic acid anions could form compounds with the free iron and aluminium in the soil and thereby prevent the fixation of the phosphate, thus rendering it available to plants. Of the organic acids, like citric, oxalic, tartaric and malic which were tried, the citrate ion was outstanding, with power to influence the phosphate release at a wider range of pH viz., 4–9 for aluminium phosphate and 4–6 for iron phosphate than the other acid ions.

As the fixation of phosphate is high in acid soils, lime application to change the pH was the next solution tried by many workers. Hopkins (4) has pointed out that if an iron phosphate complex has been precipitated at a pH of 4·0, a change to pH 6·0 by adding alkali will release only 7% of the phosphate, which has been fixed while the citrate ion could release 89%. And hence lime application may owe this effect not to pH change but to its ability to increase bacterial activity which ultimately results in the polyuronides and increase in organic acid ion giving an effect similar to the polymers now on the market under the patent names Krilium, Aerotil etc.

These ameliorative measures have been tried out in the laterite soils of Malabar on a field scale embodying different combinations of superphosphate, lime and green manure with paddy as the crop grown. Three years' trials showed that the maximum production of grain and straw is obtained by the application of high dosage of superphosphate at 60 lbs. P_2O_5 per acre in conjunction with liberal dosage of green leaf at 7,500 lb. of Vengai leaf (*Pterocarpus marsupium*) per acre and lime at 3,000 lb. per acre (8).

From the above two factors discussed, it will be evident that feeding plants through the soil is not a simple addition of the required nutrients but is a complicated process involving many aspects of Soil Science. The newer methods to improve the mineral status of the plant tries to obviate the effect of the soil and its reactions and comprises of the following:

(1) Foliar spraying.
(2) Chemical injections.
(3) Presoaking of seeds.
(4) Soilless cultures.
(5) Plant hormones.
(6) Isotopic tracers.

Foliar sprays: Feeding through the roots is a slow process and is often faced with complication due to the interaction of the soil on the added nutrients whereas feeding through the leaves is claimed to give immediate benefit to plants. The assimilation is said to take place within a few hours. The Monsanto Chemical Company has put on the market a product known as Folium a 20–20–20 N-P-K water soluble concentrate which is claimed to produce excellant results on vegetables, flowers and meadows. An advantage with this mode of feeding is that the dosage per acre is only a fraction of what is applied to the soil. The use of foliar sprays of urea to fruit trees is well known. The leaf feeding can be taken advantage of for the phosphate nutrition in the laterite regions.

The role of micro nutrients, the so called trace elements such as iron, copper, zinc, boron etc., in the nutrition of plants is great. Some spectacular results have been obtained with citrus and other fruit crops by applying these as foliar sprays.

Chemical injections: Injections of iron and zinc salts to fruit trees like pears and peaches have been in vogue in California to correct these deficiencies and many elegant devices and recipes for feeding plants through injections of nutrient solution have been developed in recent years. Treatment of soil only, in the absence of information derived from other techniques could easily lead to erroneous conclusions. A case in point is afforded by a study of zinc deficiency in California (2). In a peach orchard showing zinc deficiency, it was computed from results of plant analysis that the trees and fruits removed about 8 ounces of zinc in seven years; yet an analysis of the soil showed 3,000 lbs. of zinc to the acre within root zone. In another zinc deficient soil, 1.500 lbs. of zinc sulphate applied to the soil failed to cure zinc deficiency in apples. It would be easy to miss the nature of deficiency in these cases if treatment were confined only to the soil. On the other hand, the essential status of zinc was demonstrated by techniques of foliar spraying or tree injections.

Feeding the seed before sowing: Presoaking the seeds in nutrient solutions before sowing is yet another method adopted lately in the feeding of plants. Thus presoaking of potatoes with a 5% solution of potassium phosphate has been claimed to increase the yield. Under local conditions, soaking of paddy in a molar or semi-molar solution of tribasic potassium phosphate has increased the grain yield by 13%. In groundnut, 2 to 5% of monopotassium phosphate

gave increased yields to a marked extent. Pretreatment with hormone solutions like β–Indol acetic acid also increased the yields though to a lesser degree than tribasic potassium phosphate (7).

Soilless cultures: A large number of species of higher plants have been grown successfully in artificial cultures with the roots furnished only with a solution of inorganic salts under suitable conditions of root aeration. Under normal conditions, these plants which include most of the Agricultural species, are fully capable of synthesizing the organic substances which they require. There has been no evidence that plants so grown are deficient in dietary essentials.

Plant hormones: Just as certain substances are essential for regulating and controlling animal growth, certain chemicals are necessary to accelerate or alter the course of normal plant growth. These are known as plant hormones. It was discovered in 1931 that human urine contains growth promoters for plants, known as Auxins. It has been observed (1) that there exists Auxins 'a' and 'b' both chemical compounds possessing the formula $C_{18}H_{32}O_5$ and $C_{18}H_{30}O_4$ respectively and structurally very similar to human sex hormones. Hetero auxin is β-indole acetic acid which is also found in animal urine and is a useful plant hormone. β-indole buteric acid has been found to possess properties with which root development in soil is greatly exaggerated. Sulphanilamide upto the concentration of 30 parts per million in soil improves tomato production. Likewise, chloro-picrine treated soils greatly increase the yield of tomatoes and in one case 378 percent of normal yield has been reported.

Use of radioactive isotopic tracers in the feeding of plants: The use of radioactive isotopes in the study of plant nutrition is worth mentioning here as a recent advance in the feeding of plants. The use of these isotopes though not used directly in increasing the yield of crops have been of much use in the study of the methodology of plant nutrition. By the use of the isotope of a mineral in the nutrient media the intake and the distribution in the plants of the particular mineral can be followed through.

Thus, the science of plant nutrition is definitely marching forward and is gradually developing into many interesting branches. As in the other fields of Agricultural Science, there are many factors influencing the nutrition of plants which needs more and more of intensive study in the near future.

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A Passion Fruit for the Plains

by

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Introduction: Several kinds of creepers known as "passion vines" are grown for their edible fruits as well as for their ornamental flowers in India. A few of these, commonly called "the purple granadilla", "the giant granadilla", etc., have been disseminated over a number of years in certain localities and are now growing as part of the natural vegetation. Recently there has been some effort to grow one of these, viz., the purple passion fruit, commercially in South India. This purple passion fruit is an important crop in Australia, New Zealand, Hawaii and other countries and in South India it grows luxuriantly and bears heavily in Coonoor, Ootacamund, Kodaikanal, Sheveroys and other places of high altitude. It needs a mild climate and at lower altitudes the vines are found to be extremely vigorous in vegetative growth but produce very little crop. Recently an yellow fruited variety has been introduced into South India from Ceylon and investigations on this variety have shown that it is of relatively easy culture and is well adapted to the plains

and lower altitudes. It grows very vigorously, comes to fruit within a year of planting and produces an abundant crop of fruits in successive waves with little attention. Its fruits have a decidedly better flavour than that of the purple passion fruit.

Uses of the Passion Fruit: Although passion fruit has been under cultivation in India for a number of years its use is not so widespread; the fruit is acidic in taste and therefore is not much favoured for direct eating. But it lends itself excellently to be used in a number of preparations because of the peculiar aromtic pleasing flavour of the pulp, and so is much in demand in other countries. The most important of these preparations is the passion fruit squash, a very delicious product, extremely pleasing and nutritious and a most excellent drink for the summer. The squash is prepared by extracting the juice by means of pressing the pulp in a cloth and adding to the juice the calculated amount of sugar. If a chemical preservative is added, the squash will keep well for nearly two years and it should be diluted five or six times with water before use.

The fruit is also used in making various kinds of cocktails, cordials, jelly, syrup, sherbet, ice-cream, flavouring for icing, candy, cakes etc. A very satisfactory canned product may be prepared by adding the fresh passion fruit pulp to a boiling hot sugar syrup. Some of the preparations of this fruit well known in other countries are the following:

Passion fruit-coconut candy:	Prepared with passion fruit pulp, sugar and shredded coconut
Passion fruitade:	The syrup is mixed with water, poured over crake ice and taken in summer.
Fresh passion fruit punch:	A mixture of juices of passion fruit, lemon and pineapple poured over cracked ice.
Hot spiced passion fruit juice:	A mixture of passion fruit juice, sugar, water, lemon juice, clove, allspice and cinnamon is boiled and served hot with a strip of lemon peel.
Passion fruit cake icing:	Passion fruit pulp is added to butter and sugar and spread on cakes.
Passion fruit sherbet:	Passion fruit syrup is added to boiling sugar solution, egg white is added, stirred and freezed before use.
Passion fruit ice cream:	Passion fruit syrup or juice, sugar and vanilla are mixed, added to cream and freezed.

Culture of Yellow Passion Fruit: The yellow passion fruit is found to require lower altitudes and plains for best growth; the site

selected for passion fruit should be in open situations where the air will be warm and comparatively dry which is conducive for proper fertilisation of flowers.

The passion fruit is not very exacting in soil requirements. Sufficient moisture and adequate humus in the soil are important considerations. Except very heavy and poorly drained soils and soils of very low fertility, all other types can be deemed to be suitable.

The vine can be propagated by seed or cuttings. The seeds should be sown immediately after extraction in seed pans or well prepared nursery beds. In three or four months' time when the plants are about 6 to 10 inches in height they can be set out in their permanent sites. Cuttings taken from well matured wood strike roots readily and can be transplanted in about three months. Normally, rooted cuttings will come to bearing earlier than the seedlings.

The land in which the vines are to be set out should be well prepared in order that the young plants may establish themselves rapidly and develop a good root system.

The vines are grown on trellis, fence, bowers or pergolas. The relatively small amount of space required by the plants and their early fruiting habit make them suitable to be grown as intercrops with such orchard trees as require six to eight years to come to bearing. For this purpose, in foreign countries, the vines are planted along low wire-trellises constructed in the alleys between fruit trees. The plants are set out at a spacing of ten to fifteen feet. Passion fruit can also be grown in the form of a pure plantation.

Shallow cultivation to keep down weeds may be necessary as often as possible. The vines may be manured once a year with well rotten compost or cattle manure and a little of chemical fertilisers although in South India the vines rarely receive any manure. In other countries farm yard manure applied along with a mixture of sulphate of ammonia, superphosphate and sulphate of potash at 10 : 6 : 10 ratio at 4 to 8 cwt. per acre has given excellent results.

No pruning is practised in South India. But when the tops of vines become too dense, portions of the vines may be pruned. Removal of deadshoots and interfering branches may also be necessary for promoting good crop production. In Australia pruning is regularly practised to make the vines bear crops at different periods when better prices may be obtained.

The plants will come to bearing within a year of planting and in about the sixth year maximum bearing will be reached.

The fruit is borne on the new wood arising from old laterals and leaders and occasional pruning of such laterals will help in forstering such growth. The yellow variety produces spherical or oval fruits which are light yellow in colour when fully ripe. The central cavity of the fruit enclosed in a thick, leathery rind contains many seeds each surrounded with a juicy, orange coloured pulp which is quite acid and of a pleasing aromatic flavour. In certain areas of South India, this variety is found to be unfruitful under open pollination and in such cases hand pollination of the flowers with pollen from the same flowers has been found to promote good fruit set.

The vines are in fruit almost throughout the year but the bulk of the crop is produced from May to November.

The fruits are harvested after they attain the full colour of ripeness; some prefer to let the fruits ripen and fall to the ground and then collect them. If stored after the fruit has matured the shell dries up and becomes wrinkled but the pulp remains in good condition for several days. An yield of about 15 to 20 pounds (150 to 200 fruits) per year can be obtained from each plant.

No serious pests or diseases have been reported in this country on this fruit although in other countries several serious diseases and pests have caused much concern to growers.

Conclusion: The yellow passion fruit is a hardy, quick growing and early bearing crop and can withstand drought to some extents It requires less attention than many other fruits and is well suited to be grown as an intercrop in orchards- The fruits lend themselves for the prepartion of several delicious products and the crop is thus a rich source of subsidiary income to orchard owners. Till recently the fruit was confined only to the hill regions but with the introduction of this yellow variety, its cultivation can now be developed in the plains also. The plants are also highly ornamental and produce large, showy, flagrant flowers. This fruit merits large scale cultivation in all areas of the plains of South India.

Quality Control in the Manufacturing of Cholam Malt Extract

by

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Malt extract possesses high nutritive value and is easily digested. Plain malt extract is administered not only to infants and invalids but also is used in pharmaceutical industry as a vehicle for fish-liver oils and mineral salts. Imported brands of malt extract are manufactured mostly from barley. Siddappa (1) reported that malt extract manufactured from *Cholam* or *Jowar* (*Sorghum Vulgare*) compares favourably with other standard malt extracts. The quality of the malt extract depends upon the care and precision with which the several processes involved in its manufacture are carried out. This was evident while manufacturing cholam malt extract at the Government Malt Factory at Coimbatore. Based on that experience certain suggestions have been made in this paper regarding the application of the methods of quality control in the different stages of manufacture of malt extract.

1. **Selection of grains**: The first stage in quality control starts with the selection of the right type of raw material. Before bulk purchases are made, it is necessary to test the grains for their suitability for malting. Seed viability i. e., the germination capacity of the sample, is a very important measure of its suitability for malting since the yield and quality of the malt extract depend upon the percentage of germination of the seeds. This can be rapidly assessed with the chemical 2, 3, 5–triphenyl tetrazolium chloride (2). Bulk purchases should be made only after satisfying that the samples have a germination capacity of over 80% and the grains are well-developed, uniform in size and yellow in colour. Stocks stored in pits should not be purchased as they have very low germination capacity. Cholam grains generally retain their viability for about one year when they are stored in suitable godowns taking necessary precautions against any insect attack.

2. **Malting**: The manufacture of malt extract involves three stages, viz., (i) germination (ii) partial roasting at controlled

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temperature and grinding (iii) mashing and concentration. Strict control has to be exercised over all these processes to get a product of good quality. For germination, the cholam is graded, washed with lime water to free it from bitter resins and tannins present in the husk and then steeped in water for 24–30 hours, with intermittent aeration, changing the steeping water twice or thrice. The grains are then drained and couched for 5–6 days at controlled temperature of 67–69°F. Since this is a very important stage in the process, strict quality control is necessary to see that the grain absorbs the maximum amount of moisture and is well aerated as, otherwise, the germination and consequently the yield of extract will be low. Further, during germination also, proper care should be taken to see that the grains are sprinkled with the right amount of water and that the growth is arrested by drying in the sun when the acrospire is ¼″ long, which will usually take 5–6 days at 67–69°F. Although malting at ordinary temperatures may be cheaper and may give fairly satisfactory malt extract, it is to be borne in mind that vigorous enzyme formation and thorough modification of the grain will occur only when the malting is conducted at the proper controlled temperature of 67–69°F.

The sun dried malt, which is known as green malt, should be analysed periodically for its diastatic activity in terms of lintner degrees, saccharification time and cold water extract by standard methods (3) in order to ensure that the germination process is being carried out efficiently. A part of the green malt has to be roasted at 135–140°F for 3–4 hours to develop the characteristic malt aroma. This process also requires careful control. The green and roast malts are ground to a coarse flour of 40–50 mesh. Fine grinding should be avoided as it not only causes difficulties in centrifuging and filtration but also often results in impairing the keeping quality of the finished product, because fine particles of starch, that might pass through the filter, will facilitate the growth of mould in the extract during storage.

The water used for mashing should be tested before hand for freedom from metallic contamination or other substances which may affect the quality of the product. It should be of moderate hardness, containing only 20–40 parts of dissolved salts per 1,00,000 of which calcium sulphate or chloride should form the major proportion. Carbonates in excess of 1–2 parts per 1,00,000 are undesirable as they have the effect of making the reaction alkaline. When water conforming to the above standards is used for mashing, a pH

of 5·8–6·0, which is the optimum for cholam malt amylase activity, is obtained by the action of weak acids of the malt itself. The temperature of mashing also is of great importance in determining the quality of the final product and great care should, therefore, be taken to see that it is always maintained between 58–60°C. Any attempt to get higher yields of extract by resorting to mashing at higher temperatures should be avoided as they lead to an unattractive, cloudy product which has very poor keeping quality.

The thick mash left after decanting the clear liquid is generally centrifuged, and the centrifuged liquid mixed with the clear supernatant liquid and heated to about 80°C to facilitate quick filtration. The hot liquid should be filtered quickly under vacuo on a bed of activated carbon to prevent the development of an unattractive colour and high acidity in the finished product. The clear filtrate is then concentrated in vacuum stills at about 64–68°C to a final concentration of 78–82% soluble solids. The progress of concentration should be followed with the help of a suitable refractometer. Towards the final stages of concentration, the temperature should be kept below 60°C in order to avoid the development of any dark colour and caramelised taste in the extract. Every batch of the final product should be tested for uniformity of quality and, if need be, they should be blended suitably to get a standard product for the market.

The laboratory examination should consist of both organoleptic evaluation and chemical analysis. In the former case, caramelised taste and metallic flavours should be looked for. The chemical analysis should consist of the determination of (1) refractive index and total soluble solids (2) specific gravity (3) acidity (4) total proteins and (5) total reducing sugars expressed as maltose. The data should generally conform to the limits proposed by Siddappa (1) for cholam malt extract.

Refractive Index	...	1·4950— 1·5000
Total soluble solids by Refractometer at 28°C	...	80 —82%
Specific gravity	...	1·40 —1·45
Acidity (expressed as acetic acid)	...	0·6 —0·8
Total proteins	...	2·8 —3·2
Total reducing sugars expressed as maltose	...	65 —75

Malt extract contains maltose together with other constituents like dextrin, dextrose and small amounts of other carbohydrates. Of the reducing sugars present, maltose should naturally constitute the major proportion. The estimation of these individual reducing substances is not possible by the ordinary volumetric method of Lane and Eynon. The separation and estimation of maltose and dextrose can, however, be effected by the paper chromatographic technique. A biochemical method (4) also has recently been reported for the accurate estimation of maltose and dextrins in malt extract. These methods are not, however, quite suitable for routine control of the quality of the product at the factory. They will, however, be useful as indicators of any adulteration of malt extract with glucose syrup, etc. The estimation of ash and phosphoric acid also will be of additional value in detecting any adulteration of the product.

The quality control does not stop with the production at the factory alone. It extends to other fields such as packing, storage and distribution, which are incidental to the marketing of the finished product. Malt extract is generally reinforced with vitamins A and D, derived mostly from fish liver oils. The blending of these liver oils of high potency requires careful technical as well as analytical control. Stirring is to be conducted in an inert atmosphere to reduce losses in the vitamins. The oils as well as blended extracts should be analysed for their vitamin content to see that they are upto the standard. The final product should be packed preferably in amber coloured bottles to minimise losses of vitamin A during storage and distribution. Care should also be taken to ensure that there will be neither leakage nor spoilage of the product in the bottles. The bottles should be stored in a cool and dry place to avoid frothing of the extract and occasional bursting of the bottles. The success of the industry will depend to a large extent on the care which is taken to control the quality of the product at every stage the of process, right from the field down to the consumer.

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BOOK REVIEW

Genetics

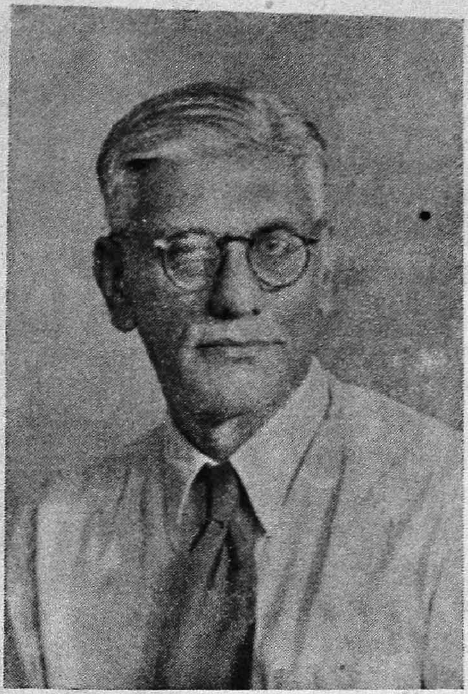
Professor Darlington's book starts with an amusing history of the science of heredity, from the Bible to Darlington, with excursions to telegony, the Kammerer case, and Lysenko. It builds up a WELTANCHAUUNG explaining the riddles of the universe in terms of chromosome and genes, and ends with a new gospel designed to cure scientifically the evils of our time. Thus, problems old and new — cancer, evolution, language, criminality, race, the classes in human society, divorce and homo-sexuality, Freud, the belief in immortality, the rise and fall of civilization, and the indeterminacy principle — are solved by saying that it is all due to the genes. The principle that what is genetically determined is rather a normal of reaction than manifest characters seems to be by-passed in a rather cavalier fashion.

Professor Darlington is, however, highly successful in giving us a mythology of the gene, where those little nucleic acid dots play a role similar to that of fairies, furies, and gods in the times of old.

[Extracted from 'Book Reviews' - *Endeavour* - Vol. XII. No. 51, July 1954.]

(N. K. I.)

OUR NEW PATRON

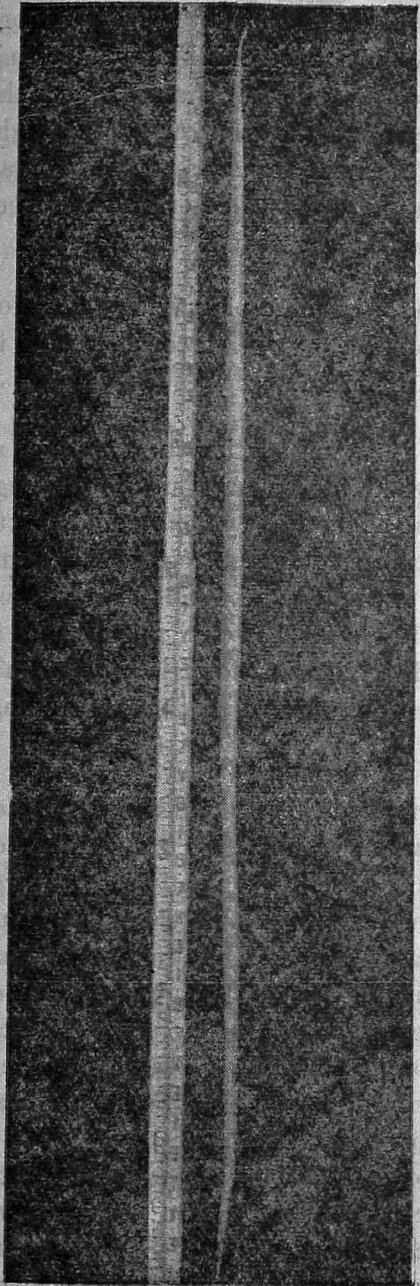


SRI M. R. BALAKRISHNAN, B. A., B. SC. (Ag.)

We are proud to welcome as our new patron Sri M. R. Balakrishnan, who was lately the Government Agricultural Chemist incharge and Lecturer in Chemistry at the Agricultural College and Research Institute, Coimbatore. He is the son of the late Rao Bahadur M. R. Ramaswamy Sivan, Retired Principal of the Agricultural College and an eminent scientist of this State. Like father like son Sri M. R. Balakrishnan was a popular officer and an able scientist and has seen service in many fields ranging from the Tungabhadra soil survey to the F. A. O. Soil Training Course held at Coimbatore. He is well known for his extra-curricular activities and was ever a prominent figure both in the athletic field and the stage. He has retired from Government service and has been pleased to honour the Madras Agricultural Students' Union by becoming its patron. We wish that all the eminent officers of the Agricultural Department would follow his example in becoming our patron and thus show their lively interest in the promotion of the art and spread of Agriculture through their support to the Madras Agricultural Journal, which is a premier organ of this State devoted to the advancement of Agriculture.

MADRAS

Nine Foot Long Snake Gourd (*Trichosanthes Anguina* Linn)



The fruits of *Trichosanthes anguina* popularly called the snake gourd are generally long, varying from about one foot to five feet. The present case recorded in this note, showed a length of 9 feet 1 inch, (vide figure) which appears to be an exceptional one. The fruit was slender and weighed 2 lb. 10 oz. This was grown in the kitchen garden of Sri Mangalam Pillai at Coimbatore with out any special attention. The vine has so far produced five fruits and as the first three fruits had grown over eight feet and had touched the ground, the vine had to be lifted up with the help of ropes.

It may be of interest in this connection to note that a special type of ribbed gourd (Luffa acutangularis) called "yard long ribbed gourd" is under trial at some of the Agricultural Research Stations of our state. A few years back the author had seen a bitter gourd (*Momordica charantia*) which had attained nearly 12 to 15 inches. Since correct information and data on these common South Indian Vegetables are not available, it is thought to be worthwhile to have records of these made; further this will give an inducement for the growing of vegetables with personal interest in kitchen gardens.

Botany Section,
Agrl. College & Res. Inst.
Lawley Road P. O., Coimbatore.
17—11—1954.

D. DANIEL SUNDARARAJ.

Botanical Gardens and Parks in Relation to Vanamahotsav

After the depredations on our forests during the second world war, which brought in its wake the failure of the monsoons and the appearance of a terrible famine, it was brought forcibly to all thinking people that there should be an all-out effort to grow trees in abundance all over the country and in all possible places to prevent the recurrence of drought and famine. It was therefore that Vanamahotsav was started as an annual feature four years ago, though the art and value of growing trees in general for the welfare of the country, has long been known to us.

Vanamahotsav work requires technical skill, a planned organisation and a sincere execution. This work should be entrusted to botanists in charge of botanical gardens, parks and arboretum.

At present there is at Madras the Agri-horticultural gardens at Teynampet, another at Coimbatore attached to the Agricultural College and Research Institute, a third and one of the most valuable and pretty gardens at Ootacamund and a fourth at Coonoor which goes by the name of Sim's Park. These gardens must be expanded and in addition to their being places of botanical research on fundamental work, they should as well serve for plant introduction and acclimatization trials and what is more important as centres for propagation and distribution of seedlings for Vanamahotsav.

In order to make people tree minded there should be a display of important hardy trees in parks which should be fast multiplied and strewn over the entire state in cities as well as in large villages. In this connection, it is interesting to note that there is a grand plan for Botanical Gardens for tropical countries. It is understood that the International Botanical Congress has recognized India's contribution in the field of botanical research by giving her a place in the Tropical Section of the First International Association of the Botanical Gardens that came into being at the Paris Session of the Congress this year. Among the two Asians elected to this body, it is a matter of pride to note that Prof. K. N. Kaul, Director of the National Botanical Gardens, Lucknow is one. It is but proper that the Indian Government have taken over Lucknow's National Botanical Gardens where an eminent botanist like Prof. Kaul is working with his band of researchers. The Madras State which can be legitimately proud of its state owned gardens, the rich herbarium, and her botanists can well link herself up with the Lucknow gardens and get plenty of material for her work. It is just possible that some exotics may prove very useful. As a matter of fact there are today amongst our very important economic plants a good many which have come from other countries and come to stay in Indian

soil and under our climatic conditions. For example, coffee, tea, rubber, Cinchona (quinine), potato, tobacco, chillies, tomato, sweet potato, cambodia cotton, sea island cotton, cabbage, carrot, apple, pear etc., are just a few that can be easily cited. Among the common useful trees which have come from outside India are to mention a few, Gold Mohur, *Peltophorum*, *Jacaranda*, *Gliricidia*, *Grevillea*, the wattles, the *Eucalyptus*, etc. In a country mainly agricultural such as ours, everybody could take up the Vanamahotsav work as a piece of social service and help the country to get enriched in its tree flora to gather the rains, give shade and yield a good many economic product.

S. N. CHANDRASEKHARAN,
Government Lecturing & Systematic Botanist
and
Vice-Principal, Agricultural College &
Research Institute, Coimbatore (Retd.)

R. S. Puram P. O.,
Coimbatore,
14th Nov. 1954.

NEWS AND NOTES

The Agricultural College Students participated in the Intercollegiate oratorical competition held under the auspices of the Red Cross Society, on 4th November 1954 in their premises. The College was represented by Mr. William Odongo Ommamo of class iii and Mr. S. Ramachandram also of class iii. Mr. Odongo knocked off the first prize and Mr. Ramachandran was awarded a special prize.

The Students gave a farewell party to Mr. Sankaranarayana Reddy, the the retiring Vice-President of the Students' Club on 12th November 1954 on the eve of his transfer as Asst. Engineer, Soil Conservation. On the same day Dr. A. Mariakulandai was elected as the new Vice-President of the Students' Club.

Sri Sundram Subramaniam of Class III won the merit award in the Inter-collegiate S. P. C. A. Essay Competition held under the auspices of S. P. C. A., Coimbatore, on "What functions do you expect the S. P. C. A. to undertake in a welfare society".

Prof. H. Enoch, Zoology Professor from the Presidency College, Madras addressed the Students on "Heridity and Evolution" on 19—11—1954 under the auspices of the Students' Club. Sri S. Kannan was the Student President for the lecture.

GLEANINGS

Plant Hormones, an extract of the Fernhurst Lecture by S. C. Harland, Jour. of the Royal Hort. Soc. 78, 157, 1954: The term "hormone" was minted in 1902 by BAYLIS and STARLING, and it is derived from a Greek word meaning "I arouse to activity." Hormones denote chemical substances secreted by the endocrine glands which, when carried by the blood stream to another organ, affect the functioning or activity of that organ.

Hormones are also called "chemical messengers." All animals possess certain tissues and organs performing different functions, and special activities. The entire body has to work as an integrated and harmonious entity. No one part or tissue has to get out of step. Organs and tissues must therefore in some way be subject to a system of co-ordinating controls. These controls are, so far as animals are concerned, of two kinds. There is first the nervous system, which "may be likened to an intercommunicating network of telegraph wires centering in the brain, spinal cord and ganglia." Second there is a complex system of hormones or chemical messengers emanating from the endocrine glands which by altering the activity of an organ, also affect the activity of others. Adrenaline, or epinephrine, is an animal hormone secreted by the adrenal glands. In periods of stress brought on by fear, rage or hunger, there is a discharge into the blood-stream of a much larger amount of this substance than usual. There is a rise in blood pressure and a general mobilization of bodily forces which enable the organisms to meet the emergency.

Another animal hormone is insulin, which is secreted by the pancreas and has to do with sugar metabolism and with the control of the blood sugar level. Failure of insulin production brings about the disease known as diabetes, and the therapeutic use of insulin for this disease is now well known.

A plant is also an association of different tissues and organs which require the same kind of co-ordination as we have seen to be necessary in animals. Plants have no nervous system and any co-ordination must therefore be through other mechanisms. It can be shown that there are in plants chemical substances which are formed in one part of the plant; they pass to other parts; they produce special growth effects, and they are thus entitled to be known as plant hormones.

Hormones and Root Growth: An example of hormonal regulation in a plant is provided by the relationship between roots and leaves. By means of special techniques it is possible to grow excised roots in an aseptic culture medium. If this medium contains the right substances in the right amounts, these isolated roots grow as fairly normal roots. The medium first employed was one containing a complete array of mineral salts, with added sucrose, to supply the carbohydrate normally transported from the leaves to the roots. In successive transfers of flax roots to fresh media it was found that growth became poorer with each successive transfer. The roots needed something for growth which they were either not getting at all or which they were making in too small an amount. The necessary substance proved to be the well-known vitamin thiamine, and it was needed in the very low concentration of one part to ten million. When supplied the roots grew well.

The nutritional requirements of Tomato roots are somewhat different, and vary somewhat from strain to strain. Some strains need not only thiamine, but also pyridoxine, nicotinic acid, or both these substances.

How does the root obtain its supply of thiamine and other necessary substances? It can be shown by some simple ringing experiments that in the

Tomato plant thiamine accumulates above a stem girdle between the root and the stem, and also above rings at the base of the leaves.

Thiamine is therefore a factor influencing cell division. It is also a factor influencing respiration. Pyridoxine is concerned with the synthesis of amino acids; nicotinic acid has to do with respiratory enzymes. All three substances thus play an essential part in the biochemical economy of the plant.

Leaf Growth Hormones: The amino acid adenine functions as a leaf growth hormone in the pea plant. When tried with leaves of certain cereals, however, it was without effect. It is therefore likely that different species of plants need quite different substances to play the role of leaf growth hormones.

Stem Growth Hormones: These comprise a series of hormones which are synthesized in the apical bud or young extended leaves and then transported to the elongating parts of the stem. If you take a section from the growing region of a pea plant which has been kept in the dark, and place it in a nutrient solution containing mineral salts and sugar, there is practically no growth. But if a small amount of the substance IAA (indoleacetic acid) is added, there occurs a very rapid elongation of the excised section.

This substance, IAA, is therefore proved to be instrumental in speeding up the growth of stem tissue. It works also in very low concentration, since only about ten parts per million are required to bring about the effect. Growth substances such as IAA and related compounds are known as auxins. Auxins are concerned not only with stem elongation but also with other growth co-ordinating processes within the plant.

More instances of Hormone Effects: It is now possible to grow the excised ovaries of Tomato in a culture medium. The tiny ovaries are excised shortly after pollination and placed in a medium supplemented by the juice of either green or red tomatoes. This juice presumably contains substances necessary for growth which are probably transported to the ovary from other sites, but neither the sites nor the chemical nature of the substances are known. Lately it has been discovered that the substance NOA (naphthoxyacetic acid) acts as an adequate substitute for tomato juice. The cultivation of fruits in artificial media obviously has exciting possibilities for the future.

Nutritional Needs of Plant Embroys: Minute and only partly developed embroys can be caused to develop by using an artificial culture medium supplemented by additional substances in low concentration. These include some vitamins of the B complex such as thiamine and pantothenic acid. Other unidentified compounds are known to be contained in yeast extract, malt extract, and coconut milk. The growth of mature embroys can be speeded up by addition to the medium of thiamine, biotin, nicotinic acid, and other special substances.

Wound Hormones: Wound-produced substances may also be counted among the plant hormones. If a Potato tuber is cut, the surface soon becomes covered by a layer of corky cells, but if the injured surface is washed just after cutting, the layer of healing cells is not formed. One wound hormone has been isolated from injured Bean pods. It is known as traumatic acid. It is not effective with tissues other than those of the Bean and it seems likely that different species of plants are characterized by wound hormones of chemically diverse types.

List of Plant Hormones: *Indoleacetic acid.* The hormonal function of IAA (indoleacetic acid) was first discovered in 1934 It was the first naturally occurring hormone to be identified, although MAJIMA and HOSHINO of Japan had synthesized it as early as 1925.

In 1935 ZIMMERMAN and WILCOXON announced the discovery of other organic synthetic substances with hormonal properties. The most important of these were: NAA (naphthalene acetic acid); and IBA (indolebutyric acid).

In 1938 LEVINE established that another substance behaves as a hormone: NOA (naphthoxyacetic acid).

In 1942 ZIMMERMAN and HITCHCOCK reported on the effects of yet another synthetic compound on plant growth: 2, 4-D (2, 4-dichlorophenoxyacetic acid).

In 1943 ZIMMERMAN found that 2, 4-D induced hormonal responses in plants. These four synthetic hormones, all discovered within a period of eight years all produce hormonal responses, but to different degrees.

The list of synthetic substances with growth regulating properties which can be used in agriculture and horticulture is now very large.

It will be of interest to enumerate some of the things which plant hormones can do, and for which they are used at the present time.

1. Weed control.
2. Cause flowers to remain on a tree.
3. Cause flowers to drop off.
4. Produce fruits without pollination.
5. Prevent the formation of fruit.
6. Cause more fruits to develop.
7. Cause total or partial elimination of fruits.
8. Produce earlier fruits.
9. Produce later fruits.
10. Produce seedless fruits.
11. Produce fruits with more seeds.
12. Induce root formation (on cuttings).
13. Prevent the sprouting of tubers (Potato).
14. Cause defoliation.
15. Enable difficult plant hybrids to be made.

This list is a formidable one, and it will be readily seen that these practices do represent an enormous advance in agricultural techniques and that we are veritably in the middle of an agricultural revolution.

1. *Weed control:* It will have been noted that the discovery of the hormonal properties of the substance 2, 4-D took place in 1942.

2. *Prevention of pre-harvest drop of fruit:* The second largest outlet for the use of plant hormones is for the prevention of pre-harvest drop in fruit. The weed-killing substance 2, 4-D has also been used for this purpose, and also for accelerating the ripening of green bananas and apples. There are now many proprietary products on the market, but chemically they all appear to be naphthalene acetic acid (NAA) or a new substance, 2, 4, 5-trichlorophenoxy-propionic acid.

NAA is applied as a spray at a concentration of ten parts per million or as a dust at 0·1 per cent. The time of application is just as soon as much dropping becomes evident. The substance 2, 4, 5-trichlorophenoxypropionic acid (2, 4, 5-TP) is effective in controlling fruit drop and is also said to improve colour. Varietal differences affect the efficiency of the particular chemical substance used. NAA does not work very well with some varieties whereas 2, 4-D has been a success.

3. *Elimination of excess fruit:* The problem of how to deal with too much fruit in Apples and other fruits has also been the subject of experiment. Hand thinning is of course an expensive operation. Here the same substance NAA is used at low concentration, and is applied at the flowering stage or shortly after.

4. *Hormones in horticulture:* (a) Prolonging the blooming period. The use of hormones in horticulture is now widespread for a great variety of purposes. They will prolong the flowering period of such trees as the flowering Cherry (*Prunus spp.*).

The spray should be applied when most of the flowers are fully open.

(b) Preventing fruit production in flowering trees. Several compounds are used, depending on the species involved. NAA works with some species (*e. g.* Horse Chestnut) but now with others (some types of purple Crab Apple).

A compound so far not mentioned, maleic hydrazide was found to prevent the fruiting of the Maidenhair tree (*Ginkgo biloba*).

(c) Rooting of cuttings It is common knowledge that some plants can be grown very easily from cuttings and others not at all. Hormones can be used to hasten rooting. There are many synthetic products in commercial use and these are mainly IBA (indolebutyric acid) and NAA (naphthaleneacetic acid) together with related compounds.

(d) Producing fruits without pollination. A hormone spray will induce abundant setting of fruit, not only in Holly, but also in Tomatoes, Fuchsias, and many other plants.

Seedless tomatoes can now be produced to order by using a large range of compounds.

Indolebutyric acid is recommended, but there are now many others.

(e) Preventing Potato and stored nursery stock from sprouting. Hormone treatment can be used for inhibiting the growth of sprouts. A good method for the small gardner is to use a handful of confetti impregnated with hormone to each bag of potatoes. The hormone used is naphthaleneacetic acid in the form of its methyl ester.

The use of hormones for making difficult plant hybrids. Hybridization between varieties within a species is usually easy. Hybridization between different species in a genus is more difficult and depends very much on the genus and on the species. Some species crosses are easy and others difficult or impossible.

One frequent cause of lack of success is the fact that even if one or two seeds do result from the application of pollen from a different species, the fruits drop off or do not mature. Or the pollen tubes grow so slowly that the flower drops off before fertilization is effected. Many new hybrids, formerly considered to be impossible have now been made with the aid of plant hormones. [A. M. K.]

Press Mud Manure for Sugarcane: Press mud or press cake is a bye-product of the sugar industry and under good working conditions the amount of this bye-product produced comes to between 1·25 percent to 1·75 percent of canes crushed. The analysis of press mud is given below:

Moisture 9·48, Phosphoric acid (P_2O_5) 5·98, Nitrogen (N) 2·03, Potash (K_2O) 0·26, Lime (Ca) 1·96.

Press mud is best dispensed by the sugar factory to the growers if and when they desire such supplies, as it is best to return to the land as much as possible of the material, which the crop takes off from the land to keep up the fertility of the soil.

Plots receiving a basal dressing of ten tons of press mud per acre gave an average increased yield of 18·44 percent of canes per acre over the plots receiving no basal dressing. The basal dressing of press mud was applied in addition to the usual top dressing of concentrates. (Madras Agricultural Newsletter, October 1954.

[A. M. K.]

CROP AND TRADE REPORT

Crop Statistics, 1953—'54 Madras State, Cotton-Additional: The area under cotton in the Madras State in 1953—'54 is estimated at 8,48,500 acres. Compared with the finally recorded area of 7,27,500 acres for the previous year and an average area of 7,64,000 acres calculated for the five years ending with 1952—'53, this is an increase of 16 6 per cent and 11·1 per cent respectively. The increase in area is generally due to better seasonal conditions in the year. An increase in area is estimated in all the districts of the State except in South Kanara where the area estimated is the same as that of the last year. The area under cotton in the Nilgiris district is little or negligible. The main or first picking of cotton was over in all the districts. The crop was affected by unfavourable weather a conditions during the growing period of the crop in Tirunelveli district and by insect pest in Coimbatore and Malabar districts. The yield per acre was estimated to be higher than that of last year. The seasonal factor for the State as a whole works out to 91 per cent of the normal as against 90 per cent for the previous year. On this basis, the total yield works out to 2,62,400 bales of 392 lb. lint including yield from Kar pickings as against 2,13,200 bales of 392 lb. lint for the previous year and an average yield of 2,56,500 bales for the five years ending with 1952—'53, representing an increase of 23 1 per cent and 2 3 per cent respectively. The area under Kar crop in the State was estimated at 85,700 acres. The yield from Kar or Second pickings is estimated at 16,400 bales of 392 lb. lint.

The estimated area and yield of cotton by varieties in the current year together with the corresponding figures for the previous year are given below:

Variety		Area in '00' acres		Yield in '00' bales of 392 lb. lint	
		1953—'54	1952—'53	1953—'54	1952—'53
(1)		(2)	(3)	(4)	(5)
Madras American (Cambodia):					
Irrigated	..	1,007	753	679	492
Unirrigated	..	1,198	920	303	233
Madras American (Cambodia-Uganda):					
Irrigated	..	421	266	287	173
Unirrigated	..	544	346	140	87
Total Cambodia	..	3,170	2,285	1,409	985
Uppam in Central Districts	..	43	32	7	5
Nadam and Bourban	..	19	—	*	—
Total Salem	..	62	32	7	5
Tirunelvelies (a)	..	1,825	1,664	431	401
Karunganni	..	3,428	3,294	777	741
Total	..	5,253	4,958	1,208	1,142
Grand Total	..	8,485	7,275	2,624	2,132

* Less than 50 bales.

(a) Includes Uppam and mixed country cotton grown in the South.

The wholesale price of cotton lint per standard maund of 82-2/7 lb. or 3,200 tolas as reported from important market centres on 18—9—1954 was Rs. 94—3—0 for Coimbatore Cambodia, Rs. 86—4—0 for Coimbatore Karunganni, and Rs. 88—14—0 for Erode Cambodia. Compared with the prices which prevailed during the corresponding period of the previous year, these prices reveal a decrease of 4·2 per cent in the case of Coimbatore Cambodia, and 2·8 per cent in the case of Coimbatore Karunganni.

Cotton-First Forecast 1954—'55 : The area sown with cotton in the Madras State upto the 25th July 1954 is estimated at 71,000 acres. Compared with the area of 62,500 acres estimated for the corresponding period of previous year and an average area of 54,000 acres calculated for the previous five years ending with 1953—'54, this is an increase of 13·6 per cent and 31·5 per cent respectively. The increase in area is attributed to favourable seasonal conditions at the time of sowings. The area estimated is the same as that of last year in the districts of Chingleput, North Arcot, Tiruchirapalli, Tanjore, Madurai, Malabar and South Kanara and an increase in area is estimated in the other districts of the State except the Nilgiris. The area under the crop in the Nilgiris district is little or negligible. The estimated area by varieties in the current year together with the corresponding figures for the previous year is given below :

Variety	Area in '00' acres	
	1954—'55	1953—'54
(1)	(2)	(3)
Madras American (Cambodia) ..	238	210
Madras American (Cambodia-Uganda) ..	93	79
Total ..	331	289
Karunganni ..	229	195
Tinnevellies ..	138	129
Uppam ..	9	9
Nadam and Bourbon ..	3	3
Total ..	710	625

The average wholesale price of cotton lint per maund of 82-2/7 lb. or 3,200 tolas on 7—8—1954 was Rs. 92—9—0 for Coimbatore Cambodia, and Rs. 82—1—0 for Coimbatore Karunganni. Compared with the prices which prevailed on 8—8—1953 these prices reveal a decrease of 9·9 per cent in the case of Coimbatore Cambodia and 7·7 per cent in the case of Coimbatore Karunganni.

Weather Review — For the month of October, 1954.

RAINFALL DATA (IN INCHES)

Division	Station	Total rainfall for the month	Departure from normal	Total since 1st January
North	Madras (Meenambakkam)	14·4	+ 2·4	34·7
	Tirurkuppam*	10·7	+ 3·4	32·8
	Vellore	6·7	— 0·1	26·7
	Gudiyatham*	8·5	+ 3·5	37·4
East Coast	Palur*	15·5	+ 8·5	39·8
	Tindivanam*	13·0	+ 6·8	39·8
	Cuddalore	18·4	+ 6·9	46·0
	Nagapattinam	16·4	+ 5·8	32·0
	Aduturai*	13·9	+ 8·6	34·8
	Pattukottai*	15·6	+ 10·5	50·4
Central	Salem	10·5	+ 4·1	36·3
	Coimbatore (A. M. O.)*	8·7	+ 2·5	24·4
	Coimbatore	9·4	+ 3·1	27·0
	Tiruchirapalli	10·1	+ 3·8	34·4

Division	Station	Total for the month	Departure from normal	Total since 1st January
South	Madurai	7·2	— 0·2	35·9
	Pamban	10·5	+ 2·0	23·2
	Koilpatti*	9·9	+ 4·2	31·5
	Palayamcottai	7·5	+ 0·4	18·3
	Ambasamudram*	8·0	+ 1·6	28·5
West Coast	Trivandrum	13·9	+ 3·2	60·2
	Fort Cochin	7·9	— 5·5	104·8
	Kozhikode	8·9	— 2·2	142·3
	Pattambi*	10·0	+ 1·4	91·9
	Taliparamba*	6·8	— 1·1	156·2
	Wynaad*	14·9	+ 6·4	96·9
	Nileshwar*	5·5	+ 2·2	177·3
	Pilicode*	6·7	— 0·1	167·1
	Mangalore	5·3	— 2·0	147·7
	Kankanady*	4·4	— 2·3	148·9
Hills	Kodaikanal	8·5	— 1·7	50·5
	Coonoor*	11·6	+ 3·4	47·4
	Ootacamund*	9·4	+ 1·0	36·7
	Nanjanad*	7·9	— 1·2	56·2

Note:—1. * Meteorological Stations of the Madras Agric. Dept.

A feeble low pressure area persisted over the east-central Bay of Bengal on 1—10—1954. This moved westwards and caused unsettled conditions in the west-central Bay on 3—10—1954, which persisted upto 9—10—1954 and became less marked. The south-west monsoon withdrew from the whole country except in South Peninsula on 8—10—1954. An easterly wave crossed the south-west Bay of Bengal on 9—10—1954 and a trough of low pressure appeared over the west-central Bay of Bengal, accentuating the seasonal trough on 14—10—1954, followed by a fresh easterly wave on 17—10—1954. In the meanwhile on 15—10—1954 a trough of low pressure developed off the Malabar coast, which persisted for five days and moved away westwards on 20—10—1954.

Unsettled conditions were observed in the south-east Bay of Bengal on 19—10—1954, which concentrated into a depression, centered near latitude 9°N and longitude 97°E on the very next day and crossed the coast near Cuddalore on the evening of 21—10—1954, causing widespread rains in Tamil Nad, with locally very heavy rainfall along the east coast. After crossing the coast the depression weakened to a trough of low which extended between South Kanara and South Coastal Andhradesa on 23—10—1954. The trough of low again concentrated into a depression off Gopalpur on 25—10—1954, while moving north-eastwards, and crossed the coast of East Pakistan after two days.

During this period another trough of low pressure developed off Malabar-South-Kanara coast on 21—10—1954 which persisted for four days and extended northwards on 24—10—1954.

The seasonal trough over the south Bay of Bengal re-established itself on 28—10—1954, accentuated by a new easterly wave from Andaman Sea. A well-marked trough of low pressure persisted on the last two days of the month in the south-west Bay of Bengal.

The note-worthy rainfalls and the zonal rainfall for the month are furnished hereunder :—

Note-worthy Rainfalls for the Month

Date	Name of Place	Rain-fall	Name of Zone	Av. rain-fall for July	Dep. from normal	Remarks
15/10/54	Trivandrum	3·3″	North	10·1	+ 2·3	Above normal
16/10/54	Pamban	2·7″				
18/10/54	Coimbatore	2·9″	East Coast	15·5	+ 7·9	Far above normal
20/10/54	Tiruthuraipundi	14·32″				
do.	Muthupet	5·20″	Central	9·7	+ 3·4	Above normal
21/10/54	Nagapattinam	3·5″				
do.	Cuddalore	8·0″	South	8·6	+ 1·6	do.
do.	Madras (Meenambakkam)	5·8″	West Coast	8·4	— 0·4	Just below normal
do.	Madras (Nungambakkam)	4·7″	Hills	9·4	+ 0·4	Just above normal
do.	Villupuram	7·90″				

Agricultural Meteorology Section,
Lawley Road P. O.,
Coimbatore.

C. B. M. & M. V. J.

DEPARTMENTAL NOTIFICATIONS

Gazetted Service — Postings and Transfers

Name and Present Post	Posted as
Abdul Samad, Supdt. A. R. S. Palur,	Asst. Paddy Specialist, Pattambi.
Bettai Gowder, Asst. Fruits, Coonoor,	Asst. Fruit Specialist, Coimbatore.
Menon, R. G., Asst. Agrl. Eng. (Research), Coimbatore,	Agrl. Eng. Indian Institute of Sugarcane Research, Bhadruk.
Nagaraja Rao, P. R., Asst. in Ento.,	Asst. Entomologist, Coimbatore.
Sahadevan P. C., Asst. Paddy Specialist, Pattambi,	Asst. in Paddy, Pattambi.
Sundaram, S., Agronomist, Satyamangalam,	Officer on Spl. Duty for Development of Coffee Industry.
Sankaranarayana Reddy, N., Estate Civil Eng. Agrl. College, Coimbatore.	Asst. Agrl. Eng. Soil Conservation.

Upper Subordinates — Postings and Transfers

Name and Present Post	Posted as
Anandam Pillai, S., A. D.. Thandigudi,	A. D. Melur.
Balasubramaniam, K. R., A. A. D., Velur,	S. D. A. Tanjore.
Bhaskaran Nambiar, K., Asst. in O. S., Pilicode,	Paddy Asst., Pattambi.
Chacko, C. I., P. A. to D. A. O., Tellicherry,	F. M., Thituvazhan Kunnu.
Ganesa Pillai, S., A. A. D., Ambasamudram,	Paddy Asst., Coimbatore.
Govindaswami, T. N., Spl. A. D., Cuddalore,	A. A. D., Chidambaram.
Hariharan, S. V., Spl. A. D. for Training, Aduthurai,	A. D., Ambasamudram.
Kolandavelu Naicker, A. D., Conjeevaram,	A. D., Tirumani Leprosy Sanatorium.
Kuruvilla, M. G., P. P A., Myco., Shoranur,	P. P. A., Mycology, Tellichery.
Lingannan, K., A. D., Tirumani,	A. D., Conjeevaram.
Mahimai Dass, V., A. D. Kollegal,	Marketing Asst., Trichy.
Mahadevan, S. K., A. D., Melur,	A. D., Thandigudi.
Purushothaman, P. S., A. A. D.,	A. D., Manganallur.
Pattabhiraman, R., A. A. D., Perundurai,	A. D., Thudyalur.
Padmanabhan, M. K., F. M., Thiruvazhankunnu,	P. P. A., Mycology, Shoranur.
Ranganathan, S., Marketing Asst.,	A. A. D., Valavanur.
Ramadass, A., Spl. A. D., Chidambaram,	A. A. D., Periapalayam.
Ramaswami, A., Spl. A. D., Gobi,	P. P. A., Ootacamund.
Raghavan Dass, Spl. A. D., Coimbatore,	Cotton Certification Inspector, Rajapalayam.
Srirangaswami, Spl. A. D., Erode,	Asst. in Cotton, Coimbatore.
Thejamurthy, Marketing Asst., Tanjore,	A. A. D., Walajah.
Thomas, N. K., Spl. A. D., Lalgudi Co-op. Stores,	P. A. to D. A. O., Tellichery.
Venugopal, P. R., Spl. A. D., Chidambaram,	Spl. A. D., Cotton, Coimbatore.